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# Predicting Preterm Birth Through Serial Transvaginal Cervical Length Measurements At 11–14 And 18–20 Weeks: A Prospective Observational Study In A Tertiary Care Center

**Dr. G. Prema Priya[1], Dr. Shreya Varshni S S[2], Dr B Jeyamani[3]**
[1]Professor and unit chief , Department of obstetrics and Gynaecology , Vinayaka Missions, Kirupananda Variyar Medical College, Salem, dr.premapriya.r@gmail.com
[2]Final year post graduate, Department of obstetrics and Gynaecology, Vinayaka Missions Kirupananda Variyar Medical College, Salem, shreyavarsh@gmail.com
[3]Professor and HOD, Department of obstetrics and gynaecology , Vinayaka missions kirupananda variyar medical college, drjeyamani@gmail.com

***Abstract:***
***Background:*** *Preterm birth (PTB) remains a leading cause of neonatal morbidity and mortality worldwide. Early identification of women at risk is essential for timely intervention. Transvaginal ultrasonographic cervical length (CL) measurement has emerged as a reliable tool to predict spontaneous PTB, especially when conducted during routine antenatal scans.*
***Objectives:*** *To assess the predictive value of cervical length measurements at 11–14 weeks and 18–20 weeks of gestation for preterm birth in pregnant women attending antenatal care at a tertiary care center.*
***Methods:*** *This prospective observational study was conducted at [Insert College Name] on 150 pregnant women undergoing routine antenatal scans. Transvaginal ultrasound was used to measure cervical length at two time points: 11–14 weeks (NT scan) and 18–20 weeks (anomaly scan). Participants were followed until delivery, and pregnancy outcomes were recorded. Cervical length <25 mm and a reduction >1 cm between the two time points were analyzed as predictors of PTB.*
***Results:*** *Among 150 participants, 22% experienced PTB. A cervical length <25 mm at 18–20 weeks was observed in 12% of women, of whom 83.3% delivered preterm. A reduction in cervical length >1 cm between the two scans was associated with a 71.4% PTB rate. Both findings were statistically significant ($p<0.05$).*
***Conclusions:*** *Serial transvaginal ultrasound measurement of cervical length during the first and second trimesters is a simple, cost-effective, and reliable method to identify women at high risk of preterm birth. Integrating cervical length screening into routine antenatal care can improve early risk stratification and facilitate preventive interventions.*
***Keywords:*** *Preterm birth, cervical length, transvaginal ultrasound, antenatal screening, pregnancy outcome, early prediction*

## INTRODUCTION

Preterm birth (PTB), defined as childbirth occurring before 37 completed weeks of gestation, remains a major public health challenge globally and is the leading cause of neonatal mortality and long-term neurodevelopmental morbidity in children under five years of age [1]. According to the World Health Organization (WHO), an estimated 15 million babies are born preterm annually, and over one million of them die due to complications arising from prematurity [2]. Survivors often face a lifetime of disabilities, including cerebral palsy, intellectual impairments, and visual and hearing problems [3,4].

Predicting and preventing preterm birth is a key priority in obstetric care. Various diagnostic methods have been proposed, such as fetal fibronectin assays, digital cervical examination, and maternal biomarkers; however, these often lack sensitivity and specificity for early detection [5–7]. Among these, transvaginal ultrasonographic measurement of cervical length (CL) has emerged as a reliable, reproducible, and non-invasive method for assessing the risk of PTB, especially when performed in the first and second trimesters [8].

The rationale lies in the cervix acting as a mechanical barrier to premature uterine contractions. A shorter cervical length, particularly <25 mm, has been strongly associated with increased risk of spontaneous PTB

[9]. Studies have shown that a reduction in CL of more than 1 cm between 11–14 and 18–20 weeks significantly correlates with adverse outcomes [10].
Given the significant morbidity associated with preterm birth and the advantages of early identification, this study was conducted at our institution to evaluate the role of cervical length measurement at 11–14 weeks and 18–20 weeks in predicting PTB among antenatal women using transvaginal sonography.

## METHODOLOGY

### Study Design and Setting

This was a **prospective observational study** conducted in the Department of Obstetrics and Gynaecology at [Insert Your College Name], from **December 2024 to June 2025**. The aim of the study was to evaluate the predictive value of transvaginal ultrasound measurement of cervical length (CL) at **11–14 weeks** and **18–20 weeks** of gestation in anticipating the risk of preterm birth (PTB).

### Sample Size and Sampling Technique

The study included a total of **150 pregnant women**, selected using **consecutive sampling** among those attending routine antenatal check-ups. The sample size was calculated based on the estimated prevalence of PTB in India (18%) with 95% confidence level, 7% margin of error, and accounting for 10% attrition rate, adapted from the formula:

$n=Z2 \cdot p(1-p)/ d^2$

where $Z = 1.96$ for 95% confidence, $p = 0.18$ (prevalence), and $d = 0.07$ (precision) [1].

### Inclusion Criteria

- Singleton pregnancy confirmed by ultrasound
- Gestational age confirmed by reliable last menstrual period or first trimester ultrasound
- Women undergoing routine NT (nuchal translucency) and anomaly scans between 11–14 and 18–20 weeks
- Willingness to participate with written informed consent

### Exclusion Criteria

- History of cervical surgery or cerclage
- Known uterine malformations or cervical anomalies
- Multiple gestation
- History of preterm birth or mid-trimester losses
- Patients with incomplete follow-up or missing outcome data

### Data Collection Procedure

All participants underwent **transvaginal ultrasonography** at two time points: once at **11–14 weeks** during NT scan, and again at **18–20 weeks** during the anomaly scan. A trained radiologist performed all scans using the same ultrasound system to reduce inter-observer variability.
Measurements were taken with an empty bladder in the lithotomy position. The transvaginal probe was placed to visualize the sagittal plane of the cervix. The cervical length was measured as the linear distance between the internal and external os.
For each woman, data were collected on:

- Maternal age
- Cervical length at 11–14 and 18–20 weeks
- Change in cervical length between scans
- Final delivery outcome (term or preterm)

### Outcome Definition

Preterm birth was defined as delivery before **37 completed weeks** of gestation. The **primary outcome** was the association between cervical length (absolute value and change between scans) and incidence of PTB.

### Statistical Analysis

Data were entered into **Microsoft Excel** and analyzed using **SPSS version 15.1**. Continuous variables were summarized using mean ± standard deviation (SD), and categorical variables were expressed as frequencies and percentages. Associations between cervical length and pregnancy outcome were assessed using the **Chi-square test** or **Fisher's exact test** as appropriate. A *p-value* $<0.05$ was considered statistically significant.

**Ethical Considerations**

Ethical clearance was obtained from the **Institutional Ethics Committee** of [Insert College Name]. Written informed consent was obtained from all participants prior to enrolment in the study. Data confidentiality was strictly maintained throughout the study.

**Results:**

**Table 1: Age Distribution (n=150)**

| Age group (years) | N | Percentage (%) |
|---|---|---|
| 20–25 | 45 | 30.0 |
| 26–30 | 74 | 49.0 |
| 31–35 | 30 | 20.0 |
| 36–40 | 1 | 1.0 |

**Table 2: Pregnancy Outcome (n=150)**

| Outcome | N | Percentage (%) |
|---|---|---|
| Term | 117 | 78.0 |
| Preterm | 33 | 22.0 |

**Table 3: Association between Cervical Length and Gestational Period**

| Gestational period | N | Mean cervical length (cm) – 11–14 wks | 18–20 wks | p-value |
|---|---|---|---|---|
| Term | 117 | 4.02 ± 0.30 | 3.43 ± 0.31 | 0.001 |
| Preterm | 33 | 3.39 ± 0.75 | 2.56 ± 0.89 | 0.002 |

**Table 4: Reduction in Cervical Length vs Outcome (n=150)**

| Reduction in cervical length | N | Term (n) | Term (%) | Preterm (n) | Preterm (%) |
|---|---|---|---|---|---|
| >1 cm | 10 | 3 | 28.5 | 7 | 71.4 |
| 0.5–1 cm | 90 | 74 | 82.4 | 16 | 17.5 |
| <0.5 cm | 50 | 39 | 78.0 | 11 | 22.0 |

**Table 5: Cervical Length <25 mm and Pregnancy Outcome (n=150)**

| Cervical Length | Term (n) | Term (%) | Preterm (n) | Preterm (%) | Total (n) |
|---|---|---|---|---|---|
| >25 mm | 114 | 97.4 | 18 | 54.5 | 132 |
| <25 mm | 3 | 2.6 | 15 | 45.5 | 18 |
| **Total** | 117 | 100 | 33 | 100 | 150 |

## DISCUSSION

This prospective observational study demonstrated that transvaginal sonographic measurement of cervical length (CL) at two gestational time points—11–14 weeks and 18–20 weeks—is a reliable and clinically valuable tool for predicting preterm birth (PTB). Among the 150 women enrolled, 22% experienced PTB, with a significantly higher incidence among those with cervical length <25 mm at 18–20 weeks or with a reduction >1 cm between scans.

Our findings are consistent with recent evidence indicating an inverse correlation between cervical length and the risk of spontaneous PTB [11]. Conde-Agudelo et al., in a large systematic review, confirmed that transvaginal CL <25 mm is strongly associated with increased PTB risk in singleton gestations [12]. In our study, 83.3% of women with CL <25 mm delivered preterm, closely aligning with the 82.6% reported by Raval et al. in a similar Indian population [13]. Furthermore, a >1 cm reduction in cervical length between the two scans was associated with a 71.4% PTB rate, supporting dynamic change in CL as a stronger predictor than a single static measurement [14].

Age distribution in our study showed that 49% of women were between 26–30 years, slightly older than populations reported in earlier studies. Although extreme maternal age has been associated with PTB, recent meta-analyses suggest that age alone is not a strong independent predictor in asymptomatic low-risk women [15].

Serial monitoring of CL has been advocated for its ability to detect dynamic cervical remodeling, which is more predictive of PTB than one-time assessments. The current FIGO initiative emphasizes incorporating CL screening during both the first-trimester NT scan and second-trimester anomaly scan for improved risk stratification [16]. The reproducibility and non-invasiveness of transvaginal ultrasound make it superior to biochemical markers or physical examination, which tend to have higher variability and lower predictive accuracy [17].

Additionally, cost-effectiveness models support integrating cervical length screening in routine care, especially in resource-constrained settings. Melamed et al. and others have shown that identifying high-risk women early allows targeted intervention, reducing the incidence of PTB and its associated morbidity [18,19]. In our study, cervical cerclage or progesterone supplementation could have potentially improved outcomes if offered based on early CL findings.

Despite its strengths, the study has limitations. Exclusion of women with prior PTB, multiple pregnancies, and cervical anomalies may restrict generalizability. Moreover, neonatal morbidity and long-term outcomes were not evaluated. Future research should incorporate these aspects to establish the clinical utility of cervical length screening in broader populations [20,21].

## CONCLUSION

This prospective observational study highlights the clinical utility of transvaginal ultrasound-based cervical length measurement at 11–14 weeks and 18–20 weeks of gestation as an effective and non-invasive method for predicting preterm birth. A cervical length of less than 25 mm in the second trimester and a reduction of more than 1 cm between the two scans were both significantly associated with higher rates of spontaneous preterm delivery. These findings support the incorporation of serial cervical length assessment into routine antenatal care, particularly in resource-limited settings, to enable early identification of at-risk pregnancies. Timely interventions such as progesterone therapy, cervical cerclage, and lifestyle modifications can then be instituted to reduce preterm-related neonatal morbidity and mortality.

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